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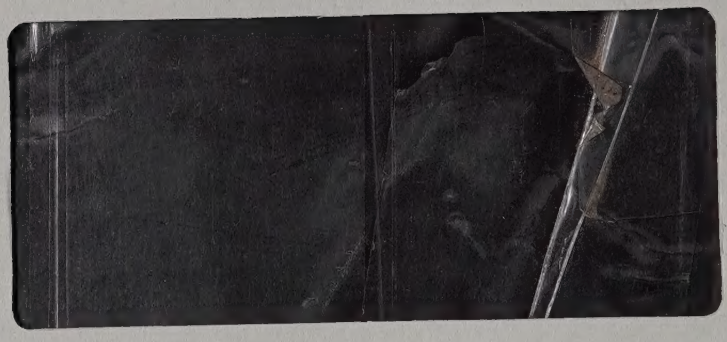
SYNC SOURCE 301

CCTV SYNC GENERATOR

ACCESSORY

INSTRUCTION MANUAL

VISUAL INFORMATION INSTITUTE, INC.



SYNC SOURCE 301

CCTV SYNC GENERATOR

ACCESSORY

Series D

INSTRUCTION

MANUAL

VISUAL INFORMATION INSTITUTE, INC.

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TABLE OF CONTENTS

INTRODUCTION 1

APPLICATIONS 2

WARRANTY 3

ACCESSORIES AND SERVICE. 4

SPECIFICATIONS 5

OUTPUT WAVEFORMS 7

INSTALLATION 9

CONNECTIONS 9

CONTROLS AND ADJUSTMENTS 10

CALIBRATION AND MAINTENANCE. 11

TROUBLESHOOTING. 14

CIRCUIT DESCRIPTION. 16

SCHEMATIC AND LAYOUT DRAWING INDEX 21

LIST OF ILLUSTRATIONS

Figure 1 - Typical Sync Generator Output Waveform. 7

Figure 2 - Detail of Vertical Sync Interval (with and without Equalizing and Serration Pulses). 8

INTRODUCTION

This instruction manual contains all essential information for the proper connection and use of the Signal Source CCTV Generators; the manual contains maintenance information as well.

This device contains circuits which are considered proprietary. Duplication of Signal Source equipment is not authorized without the express written consent of Visual Information Institute, Inc. These instruments, as described in this manual, are manufactured under U.S. Patent No. 3,483,479, plus other domestic and foreign patents pending.

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In rare instances, there may appear in this equipment a deviation from the part as called out on the schematic and in the parts list. This is especially true in the case of semiconductor devices, diodes, and transistors, where a number of types are interchangeable. The right is reserved to make use of interchangeable components where such substitution will provide equal or superior performance to that specified. It is suggested that if replacements are required, the type specified in the parts list be procured.

You are urged to read the instruction manual completely before connecting the Signal Source Generator for operation. Observance of only a few procedures will provide greater operator convenience, and will assure most effective application of the equipment as well as provide maximum safety to the user.

CAUTION

Even low voltages commonly present in transistorized circuits are potentially dangerous. Additionally, full line voltage is present on fuse terminals, power switch terminals, and other exposed points within the interior of the unit, and are accessible when the cover of the equipment is removed. Caution should be exercised, as follows:

a. Remove power by unplugging the line cord when removing covers and inspecting interior of the unit.
b. Observe the common safety practices when servicing equipment (dry skin, insulation of the body from ground, etc.).
c. Never work on electrical equipment when alone.

APPLICATIONS

SYNC SOURCE synchronizing generators develop precise pulse trains for exact and effective synchronization of closed-circuit television devices, including test pattern generators, cameras, display devices, etc. This particular generator, SYNC SOURCE 301, provides synchronizing waveforms as specified by Electronic Industries Association Standards RS-170, RS-330, and RS-343. In addition to H Drive, V Drive, and Mixed Blanking, this unit generates a Composite Sync Signal which includes front porch delays in the vertical and horizontal sync as well as serrations and equalizing pulses in the vertical interval.

The Synchronizing Generator is useable at any one scanning rate including all common rates used, 525, 675, 729, 875, 945, 1023, 1029, and 1225; other "non-standard" line numbers may be employed by special interconnection and use of the proper crystal frequency according to factory instructions. All proportions of the h-rate waveforms are adjustable by potentiometer control, permitting exact matching of this unit to other existing equipment, allowing test of apparatus under realistic operational conditions. Vertical proportions of Blanking, Drive, and Sync are counted from the horizontal rate. An alternate model, Sync Source 301A, permits adjustment of vertical proportions if desired (available upon special order).

Utilization of the pulses from the Signal Source 301 will result in an interlaced (2:1) television raster.

The unit is enclosed in a modular housing designed especially for installation as an accessory to VII Series 200 CCTV Test Pattern Generators. Other models are available for use as a free-standing, separate unit, such as the Sync Sources 306 and 311.

Change of scan rate is readily accomplished in this generator. Rate is determined by the count of horizontal lines to develop the television vertical fields and frame, as determined by the master oscillator frequency and counter interconnections. Therefore rates are selected by insertion of the proper plug-in crystal on the MASTER OSCILLATOR circuit board and by proper interconnection of jumpers on the COUNTER board. Rapid change is possible by exchange of COUNTER boards; less frequent change can be obtained by replacement of soldered jumper wires on the board.

Proper interconnections for various scan rates are shown on the COUNTER layout drawing, No. L-1016C. Proper crystal frequencies and timing relationships are set forth on drawing No. B-1212. These drawings are found at the rear of this manual.

WARRANTY

Sync Source equipment is guaranteed to be free of defects in material and workmanship for a period of 1 year from date of shipment, when operated in accordance with the instructions and specifications provided. Such warrant is made in lieu of any other guarantee or warranty, express or implied, and is offered only to the original purchaser. If such defects are confirmed through our inspection, the product will be repaired or replaced, at our option, without charge to the purchaser for parts or for labor. This warranty does not cover damages which occur in shipment or due to misuse or abuse of the apparatus, and is not applied to cables or decorative, stained, or painted finishes.

Those requesting adjustment through the terms of this warranty are instructed to contact the factory for authorization to return the equipment before shipment. Items for which authorization is issued are to be sent prepaid.

Sync Source equipment is designed and constructed using the most effective and safest industrial practice known, and in accordance with printed and accepted practices for fabrication of industrial electronic equipment. Inasmuch as Visual Information Institute, Inc. has no control over the manner in which the instrument is used, or over systems into which the equipment will be interconnected, the corporation cannot and does not assume any liability for circumstances or damages arising from use of this equipment.

This warranty does not apply to equipment which has been modified in any way to other than the original factory configuration.

ACCESSORIES AND SERVICE

The Sync Source equipment is designed for long, reliable service under adverse operating environments. It should require a minimum of maintenance or service if properly applied.

Visual Information Institute, Inc. stands ready to assist in advising as to proper application of its products, to aid in servicing instruments, and to help in CCTV system layout and operation for maximum of utility in the application of television in all areas.

A number of accessories are available for extended operation of Sync Source equipment, including special housings, cables, etc., especially designed to suit unusual requirements. Special configurations of Sync Source generators are available for integration into existing or contemplated systems, such as units without cases, special accessory functions brought to the front panel, etc.

If your equipment should malfunction or develop operating difficulty, the factory supports a liberal service and overhaul program for a fixed labor fee plus cost of parts, transportation, and insurance. Prompt attention to your equipment is pledged; do not hesitate to contact the factory in these instances.

SPECIFICATIONS

SCOPE

This specification defines the electrical and mechanical characteristics of a unit which develops precise pulse trains as required to properly synchronize television cameras, display devices, special effect generators, etc. It is designed to provide waveforms as detailed by EIA Standards RS-170, RS-330, and RS-343. Adjustment is provided for all horizontal (h-rate) pulses. This permits operation at either the nominal value or anywhere within the tolerance region set forth by standards. The sync waveform includes serrations and equalizing pulses at 2H rate during the V Sync interval.

ELECTRICAL CHARACTERISTICS

Functions - Development of precise trains for 2:1 interlaced television synchronizing, including:

- H Drive
- V Drive
- Blanking
- Sync

Output Signals - One each of the pulses described above:

- Level - 4v. peak
- Polarity - Negative going pulses
- Impedance - 75 ohm source termination
- Risetime - Nominally 0.1 usec.
- Type - H Drive, V Drive, Blanking, Sync
- Coupling-A.C. (Capacitive)

Input Signal Requirement - None

Controls - External - None

Internal - H Front Porch
H Sync Width
H Blanking Width
H Drive Width
Serration Width
Equalizing Pulse Width

Vertical Field Rate - 60 Hz

Typical Scan Rates - All 2:1 interlace, at any one rate specified, including:

525	729	945	1029
675	875	1023	1225

Waveform - In accordance with EIA Standards RS-170, RS-330, RS-343.

Power Requirement - +10v. @ 35ma
+5v. @ 400ma
-5v. @ 35ma

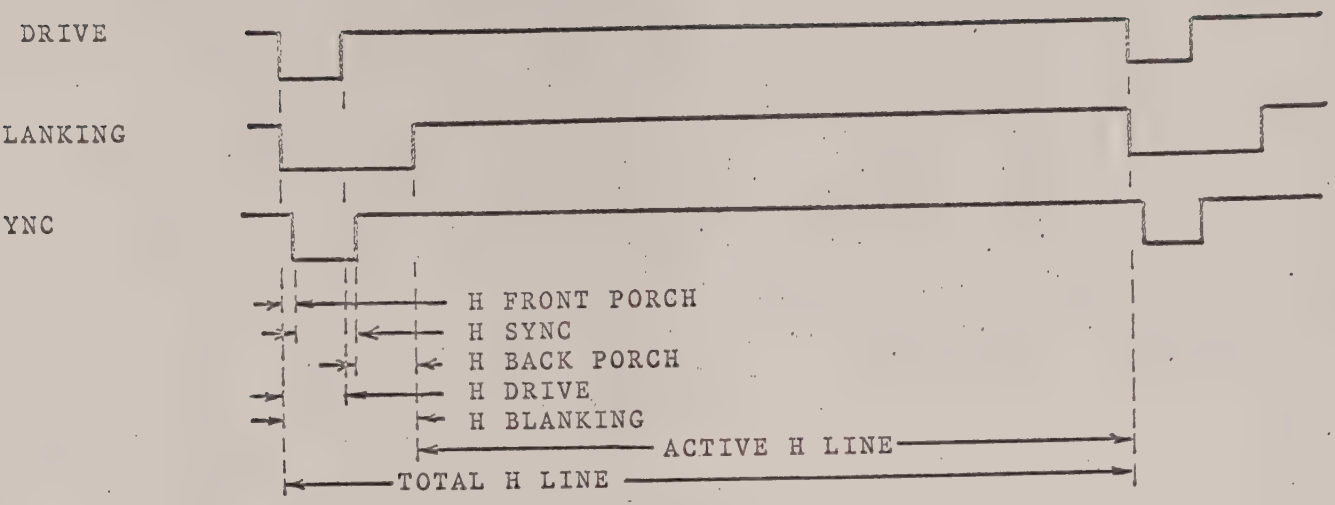
Options - Many variations are available to suit particular requirements. Vertical pulse proportions, normally derived from horizontal count, can be supplied adjustable. Other scan rates can be supplied as requested, including European 625-line, 50 cycle.

MECHANICAL CHARACTERISTICS

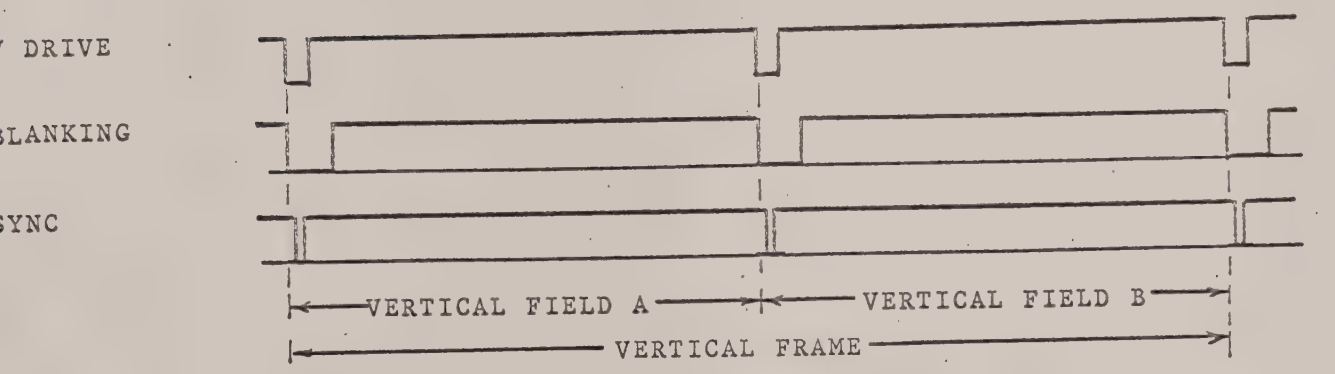
Size - Custom package for accessory installation in appropriate Signal Source CCTV Test Instruments, eight circuit cards, overall dimensions 6 3/4" w x 7" d x 5" h.

Weight - Net 2 lbs.

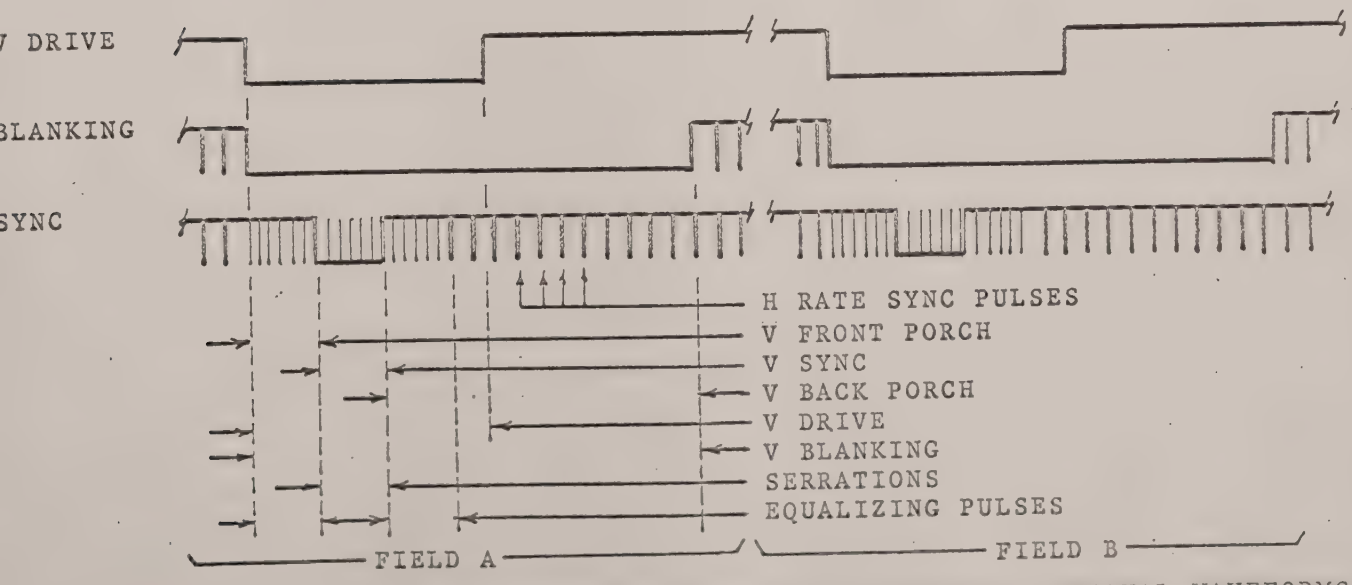
Operating Temperature Range - 0° C. to 50° C.



a. WAVEFORMS AT HORIZONTAL RATE



b. WAVEFORMS AT VERTICAL RATE



c. EXPANDED VIEW, DETAIL OF VERTICAL INTERVAL WAVEFORMS

FIGURE 1 - TYPICAL SYNC GENERATOR OUTPUT WAVEFORMS

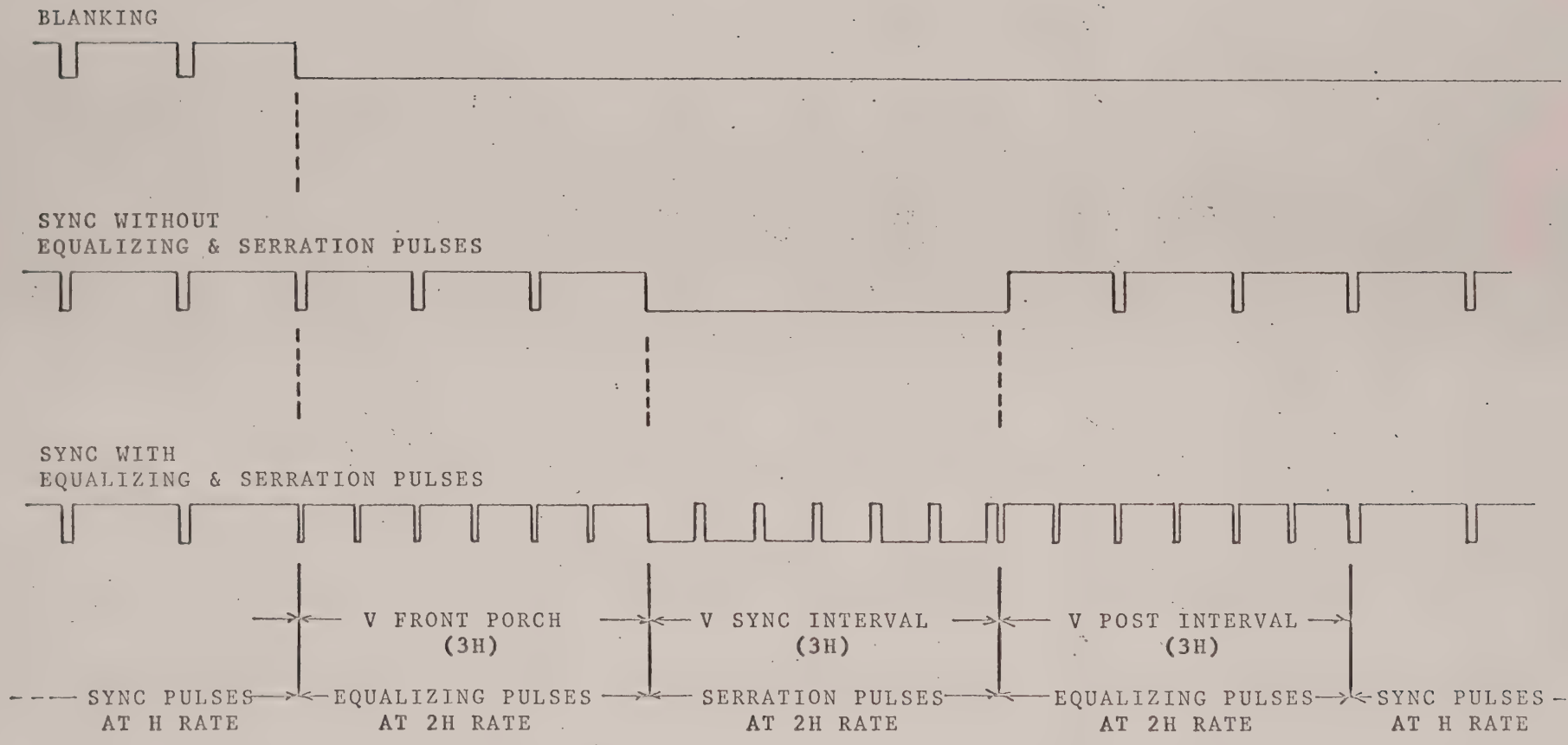


FIGURE 2 - DETAIL OF VERTICAL SYNC INTERVAL
(WITH & WITHOUT EQUALIZING & SERRATION PULSES.)

INSTALLATION

Sync Source accessory CCTV Sync Generators are supplied from the factory for mounting inside the Series 200 CCTV Test Instrument case. Units are installed in space provided between the front panel and card file, and need no special attention prior to initial operation.

CONNECTIONS

Accessory units provide output pulses at the generator cabinet Rear Connector Plate. The BNC cable jacks are marked as to function.

Dual, bridged output connectors are provided at the rear panel for external use of the sync generator waveforms as desired. The output must be terminated at all times into 75 ohms. Terminations are provided with the accessory unit if sync outputs are not terminated elsewhere.

All sync waveforms as used in pattern development are presented at front panel for reference, whether from internal or external source.

If the sync generator accessory is included, the unit serial number will identify the type of generator, for instance 00462SG301. A separate instruction manual is provided for the accessory.

CONTROLS AND ADJUSTMENTS

CONTROL ACCESS

The sync generator package is installed immediately behind the front control panel. In cainet models, access to internal controls is achieved by removal of the generator top cover; remove eight flathead screws and lift the cover from the unit. If necessary, remove the unit from racks for this access to the interior of the instrument.

INTERNAL CONTROLS

MASTER OSCILLATOR - The Master Oscillator frequency is crystal-controlled and does not require adjustment.

2H SERRATIONS - The control at the bottom of the DUAL MONO/ EQUALIZING board controls the width of serration that will be introduced into the sync signal during the vertical sync interval.

H FRONT PORCH - The control at the top of the DUAL MONO/ EQUALIZING board will adjust the width of "front porch" in the horizontal sync.

H BLANKING - The potentiometer at the bottom of the BLANKING board controls width of the H Blanking pulse.

H DRIVE - The control at the bottom of the DRIVE board is used to adjust width of the H Drive pulse.

H SYNC - The potentiometer at the top of the H SYNC board controls width of the Horizontal SYNC Pulse.

EQUALIZING PULSES - The recessed control at the top of the H SYNC board adjusts width of Equalizing Pulses which occur prior to and immediately after the V Sync interval.

CALIBRATION AND MAINTENANCE

Sync Source generators operate automatically, developing an analog television signal through digital techniques. Therefore, no extensive calibration is required, unless component replacement is undertaken. Internal controls are provided for horizontal rate pulse widths. These are to be adjusted as desired for the particular application of the equipment, and should be checked if any components in the boards are replaced. Also their values should be readjusted if another board is inserted into the unit.

Vertical timing is controlled by the counter circuits, and therefore is automatically locked to the horizontal rate. Pulse proportions can be adjusted by internal wiring modification; please contact the factory if such adjustment is desired.

Calibration Procedure:

Power supply levels in the parent unit should be closely adjusted at the POWER REGULATOR boards to +5.00v and -5.00v to establish proper reference levels for all operations. Test points are provided on the Power Regulator boards as shown in Drawing L-1006. Then proceed to the itemized procedure as listed below:

1. Refer to Drawing Number B-1212 for proper timing relationships for the scan rate in use.

2. Sync the oscilloscope from the leading edge (-) of H Drive. Set oscilloscope sweep rate as desired for inspection of timing as described in each step of adjustment.

3. Observe the H Drive waveform at the rear panel. Pulses should be 8 volts, pk-pk (unterminated negative going, with leading edges spaced as shown on Drawing B-1212 for the various scan rates (63.4 usec at the 525-line rate.) Adjust the pulse width to the proper value by use of the control at the bottom of the DRIVE board.

4. Observe the Blanking output, with oscilloscope sync remaining at H Drive. Observe amplitude, polarity, and leading edge spacing to be as described above. Adjust H Blanking pulse width by use of control at the bottom of the BLANKING board.

5. Sync oscilloscope to the leading edge (-) of V Drive. Set oscilloscope sweep at 2 msec/div. Observe the SYNC output and inspect for proper waveform, and particularly note presence of positive serrations in the V Sync Interval (from 3H to 6H past V Drive leading edge, from 190 usec to 380 usec at 525-line rate.) It may be necessary to expand the sweep for this observation; delaying sweep at approx. 50 usec/div also will permit convenient viewing of the V Sync interval. Six pulses should be present in the V Sync interval (occurring at 2H rate).

   Observe that six Equalizing pulses are present before and after the V Sync interval, also at 2H rate (spaced 31.70 usec for 525-line rate). Do not adjust pulse widths at this time.

   NOTE: Gross misadjustment of the DUAL MONO/EQUALIZING board can cause a dropout of H Sync, particularly if the front porch adjustment is longer than serration timing. If sync pulse components are not present adjust the Front Porch control to minimum and Serration control to maximum pulse lengths. H Sync components should then appear; complete adjustments in manner described below.

6. Observe the SYNC output. Sync oscilloscope from the leading edge (-) of H Drive, sweeping scope at a convenient rate to show the H Sync pulses.

7. The serrations will appear as a faint trace of positive pulse half way between the H Sync pulses. Adjust the control at the bottom of the DUAL MONO/EQUALIZING board for proper serration pulse width. The trailing edge of this pulse is the leading edge of H Sync.

8. Adjust the front porch (leading edge delay) by use of the control at the top of the DUAL MONO/EQUALIZING board. Then adjust the width of the H Sync pulse by use of the control at the top of the H SYNC board. Adjust Equalizing pulse width by use of the recessed control (Equalizing pulses will appear as a faint trace inside the H Sync pulse outline).

9. Sync the oscilloscope from the leading edge (-) of V Drive. Observe the V Drive waveform and check polarity, level and width (nominally 666 usec).

10. Observe the Blanking output and check level, polarity, and width of the V Blanking interval (20 lines, 1268 usec at 525-line rate). The H Blanking pulses (as adjusted in step 4) should be present at all times except during V Blanking interval. The upper and lower baselines should be uniform with no tilt, sag, or modulation. This completes sync generator calibration.

Calibration of the sync generator accessory is now complete.

TROUBLESHOOTING

This synchronizing generator has been designed to provide the greatest reliability possible in the normal laboratory environment. Unfortunately some components, particularly capacitors and semiconductors, exhibit a limited lifetime, and lead to the possibility of component failure. In this instrument the components are derated to assure the longest possible lifetime; proper operation should be expected for at least a five year and probably ten year period.

Be sure to check the calibration procedure prior to establish that failure has occurred definitely. Often a symptom of difficulty can be traced to improper adjustment of the unit.

Failures which would occur relatively early, within 1-2 years, are most likely due to semiconductor (transistor) failure due to internal contamination at the time of manufacture or due to defective solder joints in assembly. Failures occurring at later times statistically would be attributed to electrolytic capacitor failure due to internal chemical reaction.

Fault isolation can be achieved most efficiently by determining the circuit card module causing difficulty, from symptoms in the output waveforms:

a. Lack of <u>all</u> pulses can be traced to power supply difficulties or a problem on the MASTER OSCILLATOR or DUAL MONO/EQUALIZING cards, as these develop the master timing references.

b. Apparent trouble in any one waveform such as insufficient amplitude but correct timing, or no output, could be the fault of the PULSE OUTPUT board. If it is verified that this card is operating properly, check further as listed below.

c. Difficulty in the Sync waveform only must be attributed to either the V SYNC or H SYNC boards. Note the possible dropout condition due to gross misadjustment as set forth in Calibration.

d. Difficulty in either the H Drive or V Drive signals only can be traced readily to the DRIVE board; these pulses are developed independently of all others.

e. Difficulty in the Blanking waveform only probably would be due to the mixing circuit or V bistable on the BLANKING board. A problem in the H Blanking monostable would be expected to affect the other horizontal-related components as well, for all are derived from this pulse.

f. Difficulty in all of the Vertical pulses can be attributed to difficulty in the COUNTER card, or possibly due to a deficiency in 2H toggle for the Counter as generated on the BLANKING card.

g. Difficulty in any one Vertical pulse should be related to the board in which those functions are located:
V Blanking - BLANKING
V Drive - DRIVE
V Sync - V SYNC

Note that these pulse widths are counted, and errors of this type may be related to the matrix connections on the COUNTER Card.

Should a particular board be found as the source of trouble, rapid exchange of cards is available from the factory under warranty provisions or at nominal charge for units out of the warranty period.

CIRCUIT DESCRIPTION

The SYNC SOURCE 301 CCTV Sync Generator follows the fundamental pattern employed for such devices for some time. The traditional format is used to permit flexibility in application; the output pulses can be adjusted to operate at the nominal values called out by current standards or elsewhere within or exceeding the prescribed tolerance range. Also the one set of circuit cards is operable at all recommended scan rates without major circuit alteration. Therefore the accessory easily can be made to match any system to which it is applied.

In order to provide interlace, the master oscillator operates at twice horizontal (2H) rate. The serrations and equalizing pulses are developed directly from this master timing reference, also at the 2H rate. From this point, the master timing pulses are divided by count to generate horizontal (H) rate and vertical (V) rate pulses.

The 2H front porch pulses are submitted to a 2:1 count at the BLANKING board. Therefore a controlling H-rate pulse is developed for generation of Blanking, H Drive, and H Sync; these particular pulses are generated by individual monostable multivibrators on their respective circuit cards.

The 2H rate pulses are also submitted to a counter which develops the vertical (V) rate. This circuit develops a V Reset which acts as the trigger to generate vertical pulses which signify the end of a television field (two fields constitute a frame which is one complete presentation in the vertical dimension of the television raster). Interconnections are provided on the COUNTER card to determine the number of horizontal lines in the frame.

Vertical pulses, initiated by the V trigger, are controlled for proper width by count of horizontal lines. A matrix is included on the COUNTER board to control width of the V Blanking and V Drive pulses. The V Sync pulse is at all times delayed by a 3H front porch from the start of V Blanking, and always is 3H (the time of three horizontal lines) in width.

The V Drive and H Drive pulses are developed on the DRIVE board and routed to the output circuits with no further processing. The H and V components of Blanking are mixed into Composite Blanking signal, which is processed for utilization. The H Sync, V Sync, Serration, V Front Porch, and V Equalizing pulses are processed on the H SYNC board to generate the desired Composite Sync signal which includes both vertical and horizontal synchronizing information.

The Sync Source 301, CCTV Sync Generator develops precise synchronizing signals for use in industrial, educational, and laboratory television applications. The waveform format is in accordance with EIA Standard RS-170, in that it provides equalizing pulses and horizontal rate serrations in the vertical sync interval. It meets all requirements of RS-343, RS-170, and RS-330 standards for synchronizing signals. The signals are synthesized through modern digital techniques; the generator circuits are completely transistorized, composed of multivibrators which employ high speed switching transistors. All power supplies are closely regulated to insure dependable, stable operation over wide variations in ambient conditions.

Power for sync generator operation is taken from regulated supplies in the parent unit. D.C. levels of +10v., +5v. and -5v. are required.

The MASTER OSCILLATOR circuitry develops a pulse train from a stable crystal-controlled oscillator circuit whose rise times act as the timing references for generation of all waveforms. Basically the oscillator is composed of two high gain stages with sufficient positive feedback to cause oscillation. The crystal is inserted in the middle of the loop to act as a filter and to cause operation only at the desired frequency. Gain is sufficiently high that the filtered transitions are submitted to the output as a rectangular wave. At the board output, transistor Q3 acts as an isolation stage and waveform shaper.

Specification RS-170 requires that serrations of horizontal rate be produced during the vertical sync interval. Serration polarity is opposite that of the horizontal pulses to permit detection of the vertical sync. Therefore, the negative trailing edge of the serration pulses becomes a timing reference as opposed to the negative leading edge of the horizontal sync pulses. Therefore, the pulses from the master oscillator are routed to the DUAL MONO/EQUALIZING board where a delay is produced to generate the serration pulse width. From this point on, the trailing edge of the serration pulse is used as timing references. However, the leading edge of blanking must take place previous to the timing reference. Therefore, a horizontal-rate pulse is routed to the second half of the DUAL MONO/EQUALIZING board, where a time delay is inserted to generate the proper start of blanking. This control establishes the width of horizontal front porch.

Development of an interlaced synchronizing waveform requires that the vertical information be counted from the hori-

zontal. Therefore, the reference timing edge from the DUAL MONO/EQUALIZING board is submitted to the COUNTER board for this operation via a driver emitter-follower on the BLANKING board.

The COUNTER board contains a series of integrated circuit J-K flip-flops to count out the proper number of horizontal lines which will be developed in each vertical field. Of course a different count is required for each scanning rate. This is simply accomplished in the Sync Generator by utilization of a group reset technique. Output from the proper counter stages is submitted to a series of control states that are connected to a common buss. Therefore a mixture of different counted pulses is acquired which develops a reset pulse after an appropriate interval. The reset pulse is submitted to circuitry on the COUNTER board where all elements in the counter are reset simultaneously. The trigger resulting from this reset is then used for initiation of vertical pulses. A matrix is provided for selection of the reset counts as desired for any one scan rate.

The trigger obtained at the counter reset is routed to the BLANKING board for initiation of V Blanking. It is essential that the long blanking pulse be controlled in synchronism with the horizontal scanning to prevent apparent jitter in the television display. Therefore a proper selection of pulses are taken from the earlier stages of the COUNTER board and routed to the control stages on the BLANKING board to time the end of the V Blanking pulse which is developed by a bistable multivibrator. Pulse width is controlled by matrix interconnection on the COUNTER board.

The delayed trigger from the DUAL MONO/EQUALIZING board is subjected to a 2 to 1 count to provide pulses of the proper horizontal rate. The resulting h-rate trigger is routed to a monostable multivibrator which develops the proper horizontal blanking pulse width. The vertical and horizontal blanking pulses are then combined to provide a Mixed Blanking signal. Horizontal and vertical pulses are also routed out of the board as needed to initiate other actions.

Generally speaking, drive pulses are somewhat narrower than blanking pulses in accordance with the precedent set by EIA Specification RS-170. This precedent has carried over into other scanning rates, and therefore independent drive pulse generation is required in this unit, performed on the DRIVE board. The Vertical Drive must be solidly locked to horizontal rate in the same fashion as the V Blanking pulse.

Since the same pulse width is required for all scanning rates, it is necessary to derive the V Drive pulse from a different number of horizontal lines for each rate in a fashion similar to that used for the V Blanking pulse. Therefore, a wired selector matrix is employed on the COUNTER board. The vertical initiation is to be coincident with the beginning of V Blanking interval; a trigger from the counter reset is employed to start the V Drive pulse. The control stages establish the end of the V Drive pulse after an appropriate number of horizontal lines. The Horizontal Drive pulse is initiated by the start of horizontal blanking, and is controlled in width by a monostable multivibrator.

Vertical Sync is a pulse developed within the vertical blanking interval, ordinarily delayed 3H from the start of the blanking and exhibiting a duration of 3H. Therefore, it is necessary to provide two multivibrators in the V SYNC board, one to produce the front porch delay, and the other to produce the vertical sync width. It is a further requirement that the vertical sync pulse be absolutely locked to the horizontal scanning rate. Therefore, pulses from the COUNTER board are used to trigger bistable multivibrators which develop the V Front Porch and V Sync pulse. The completed signal is routed to a mixer which gates the serrations into the V Sync interval for use in the H SYNC board.

Horizontal Sync is simply a pulse developed from the front porch delayed H rate by a monostable multivibrator. However, the operation becomes more complex during the vertical interval when equalizing pulses must be developed. At the input to this board a gating circuit is employed which permits selection of either H rate triggers for ordinary operation or 2H rate triggers for development of equalizing pulses during the vertical front porch interval and after vertical sync has ended. This gate also must control pulse widths developed, for equalizing pulses are narrower than the normal horizontal sync pulses. Additionally, previously no timing reference has been generated for the period of time in which horizontal equalizing pulses will be developed after vertical sync; a counter controlled bistable multivibrator is provided on the H SYNC board for this purpose. The completed sync signal is then mixed with the serrations from the DUAL MONO/EQUALIZING board as gated in the V SYNC board for use at this time. The completed sync signal is then routed to the PULSE OUTPUT board for utilization.

The PULSE OUTPUT board converts the pulse trains to the proper polarity and impedance for feeding coaxial cables in a source terminated configuration. Four identical line driver

circuits are provided, one each for H Drive, V Drive, Blanking, and Sync. Pulses are routed in to a direct coupled inverting stage which develops the desired negative going polarity. This stage operates from a +10v. B+ voltage level, and is a saturated switch. Therefore a pulse of good risetime and nearly 10v. in peak to peak amplitude is developed. This is submitted to a complementary emitter-follower output stage which transforms impedance to a very low value. Series resistors are provided in the signal path to provide the desired value for source termination. An a.c. coupling capacitor is provided to remove any d.c. reference; current standards forbid the presence of any consequential direct current component in sync generator output signals. In this manner 8v. pk-pk signals are developed which will provide a 4v. pk-pk pulse in properly terminated coaxial cables.

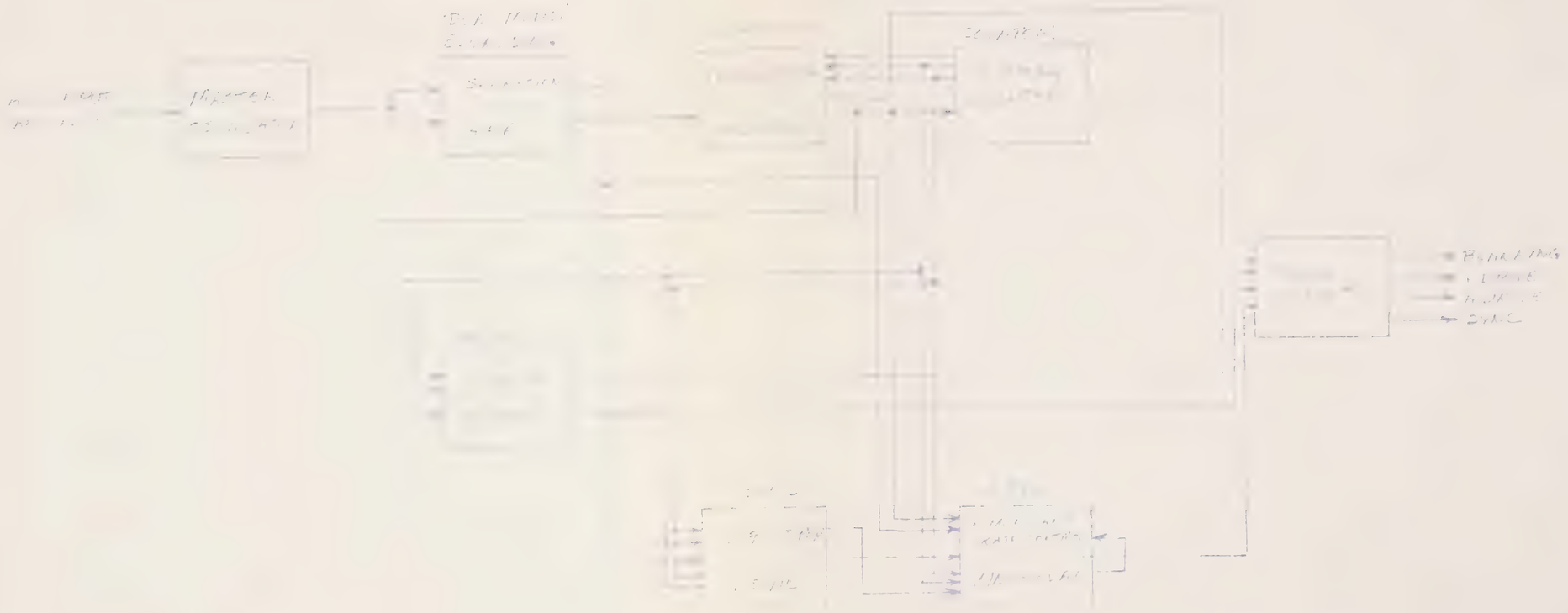
The operations described above are conducted in the sequence shown on the accompanying block diagram. The complete waveform is shown on the following drawings. A complete, detailed schematic of individual circuit boards is included in the following pages. Typical timing relationships for various scanning rates are shown on Drawing B-1212.

SYNC SOURCE 301

CCTV SYNC GENERATOR ACCESSORY

Schematic and Layout Drawing Index

No.	Description
S-0202	Function Diagram - Sync Source 301
PL-1010	Electrical Parts List Cover Sheet
S-0151	Master Oscillator - Crystal
L-1022	Master Oscillator - Crystal
S-0143	Dual Mono/Equalizing
L-1021	Dual Mono/Equalizing
S-0145	Blanking
L-1017	Blanking
S-0144	Counter
L-1016	Counter
L-1016C	Scan Rate Connections
S-0194	Drive
L-1051	Drive
S-0195	V Sync
L-1046	V Sync
S-0196	H Sync
L-1047	H Sync
S-0148	Pulse Output
L-1020	Pulse Output
S-0150	Chassis Wiring - Sync Generator
B-1212	CCTV Sync Timing Relationships



CCTV SYNC GENERATOR [illegible] COUNTER V INTERVAL	TAV-314
DRN	DATE 9-17-68
APPVD	DATE 9-17-68
	SHEET 5-020R

PARTS LIST

Electrical Parts List Cover Sheet

RESISTORS - Unless otherwise noted, 1/2w. 10% IRC-GBT or equivalent.

POTENTIOMETERS - (Board Mounted) Bourns E-Z Trim Type 3067-S

CAPACITORS - a. 1000 pf and below - Dipped Mica, CDE Type CD15-, ARCO Type DM-15-. Value as Noted, +5%.

b. .001 uf to 0.1 uf - Wrapped Mylar, CDE Type WMF, 100v. ± 10%.

c. 0.1 uf to 5 uf - Solid Tantalum, Kemet Series C - Polarized, ± 10%, 15v. or higher voltage rating.

d. 5 uf to 100 uf - subminiature electrolytic, Sprague TE (30D) -10% +150%. Value and rating as noted.

e. Above 100 uf - Electrolytic, Polarized, CDE Type BR, "Blue Beaver".

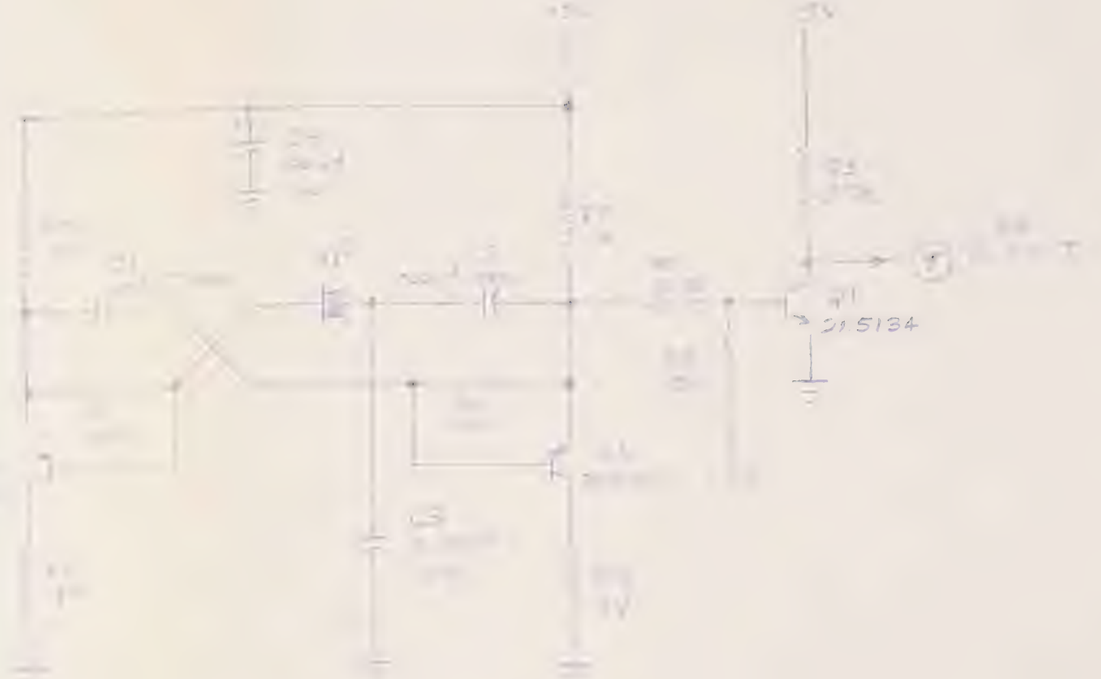
SEMICONDUCTORS - Per JEDEC Number 1N--, 2N--, etc.

CIRCUIT BOARDS - Vector Type 838A.

BOARD PINS - USECO No. 2510B, Keystone No. 1575-2

POWER CONNECTIONS

+5V	-5V	GRD
X	W	R



NOTES: 1. CRYSTAL FREQUENCY DESIRED FOR HIGHER SCAN RATE, PER TABLE I

2. RESISTORS 1/2W 10%

SCAN RATE (2:1 INTERLACE)	CRYSTAL FREQUENCY (kHz)
525	31.50
675	40.50
875	52.50
945	56.70
1023	61.38
[illegible]	61.74
[illegible]	73.50
[illegible]	30.66
[illegible]	43.74

REF: DWG. L-1022

PUBLIC INFORMATION INSTITUTE INC
TEXAS OHIO

MASTER OSCILLATOR (CRYSTAL) CIRCUIT BOARD

DRN. [illegible]	DATE 3-23-67
CHK. [illegible]	DATE 4-22-67
	S-0151
NO. 4-26-70	

MASTER OSCILLATOR (CRYSTAL)

JH 8/26/52

DWG. NO L-1022

REF: SCHEMATIC NO S-0151

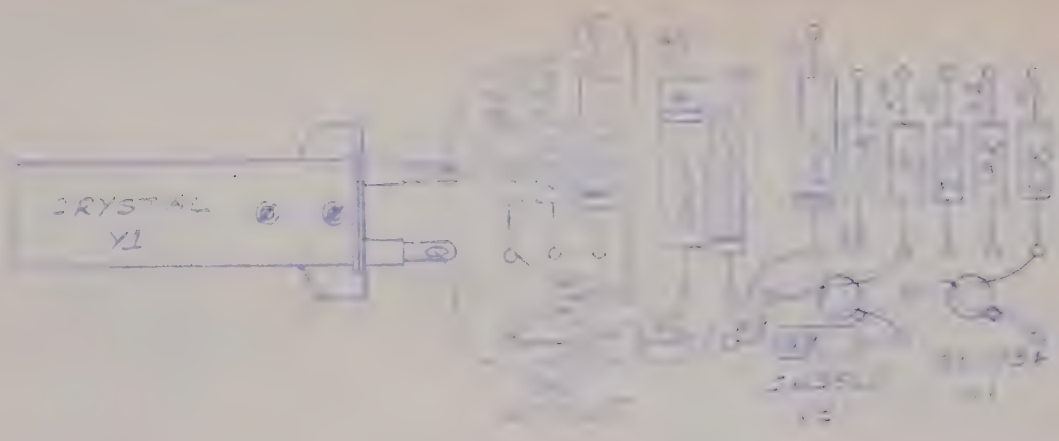
MATERIAL LIST

100K

1X .1 mf @ 6v.

0.1 MF @ 100v.

0.001 mf @ 1000v.

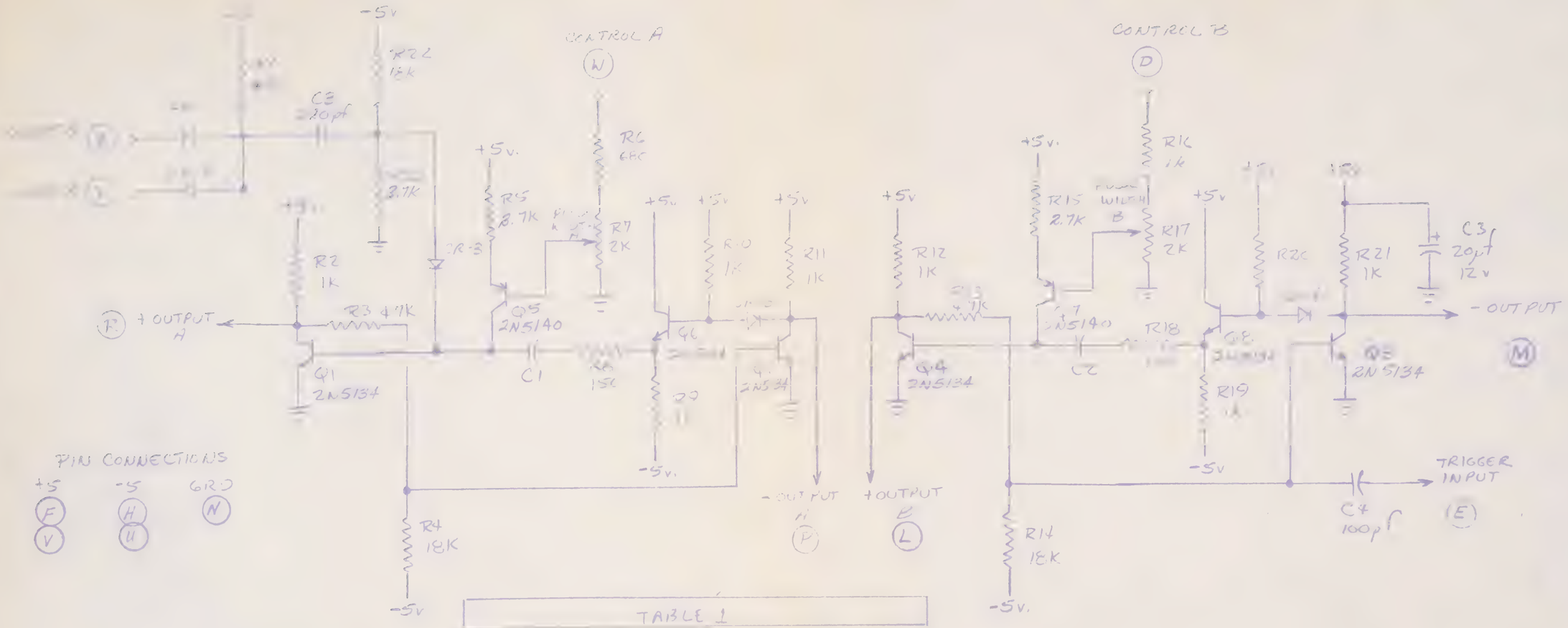


Z Y X W V U T S R P N M L K J H F E D C B A

INSULATED WIRE, #24 STRANDED

30 TERMINALS

NOTE. CRYSTAL SELECTED PER TABLE I, DWG. S-0151



PIN CONNECTIONS

+5	-5	GRD
F, V	H, U	N

NOTE S
1. ALL DIODES IN4154
2. RESISTORS ½W ± 10%
3. C1 & C2 VALUE SELECTED PER TABLE 1.

TABLE 1

USE	C1	C2
V WINDOW	1.0 μf	2.2 μf
H WINDOW	.047 μf	.0068 μf
DRIVE	0.10 μf	0.01 μf
I-Q	.0015 μf	0.0015 μf
I-Q, V-W	1.0 μf	0.0015 μf
EQUALIZING	330 pf	680 pf
H SYNC	0.0047 μf	330 pf
DELETE	0.0047 μf	330 pf
V FLASH	1.0 μf	1.0 μf
H FLASH	0.0022 μf	330 pf
V POSITION	2.2 μf	2.2 μf

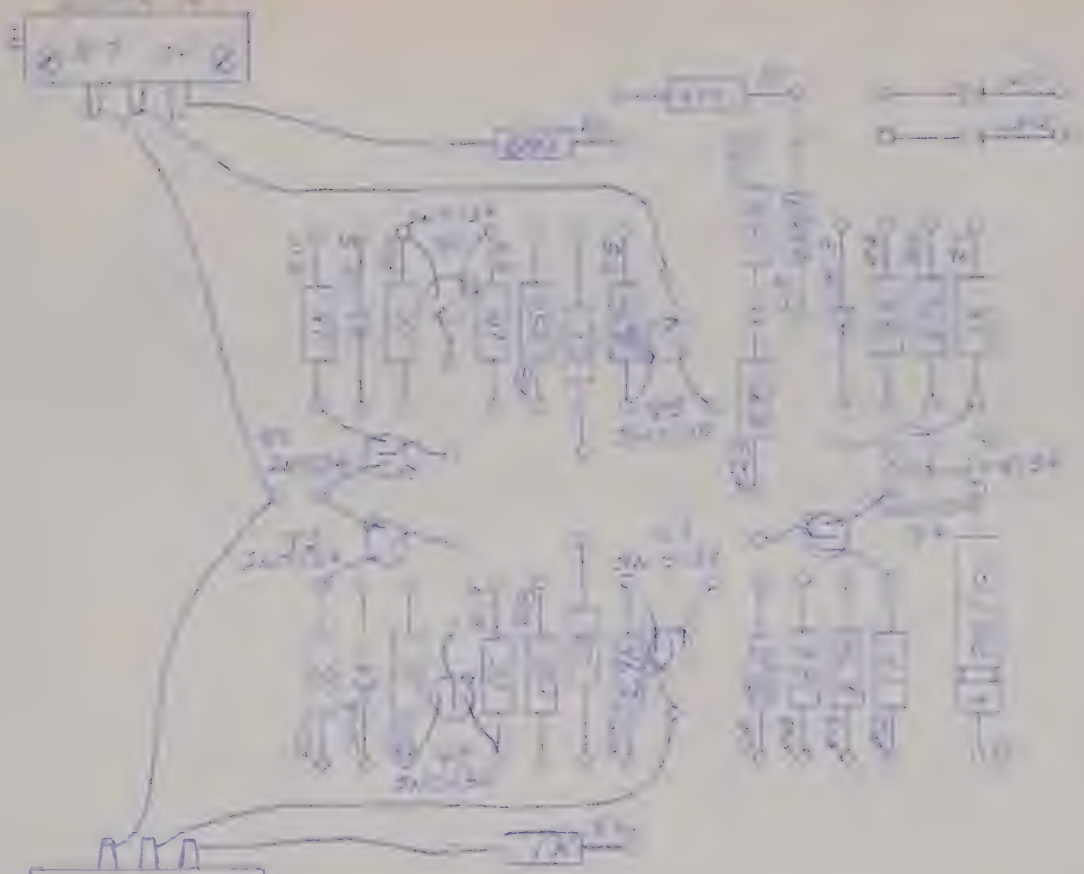
REF DWG NO. L-1021

VISUAL INFORMATION INSTITUTE, INC
XENIA, OHIO

DUAL MONO CIRCUIT BOARD

DRAWN	DATE 3/30/67
APPVD	DATE
REV 6/14/71	DWNG. NO. S-0143

DWG. NO. L-1021
REF. SCHEMATIC S-0143

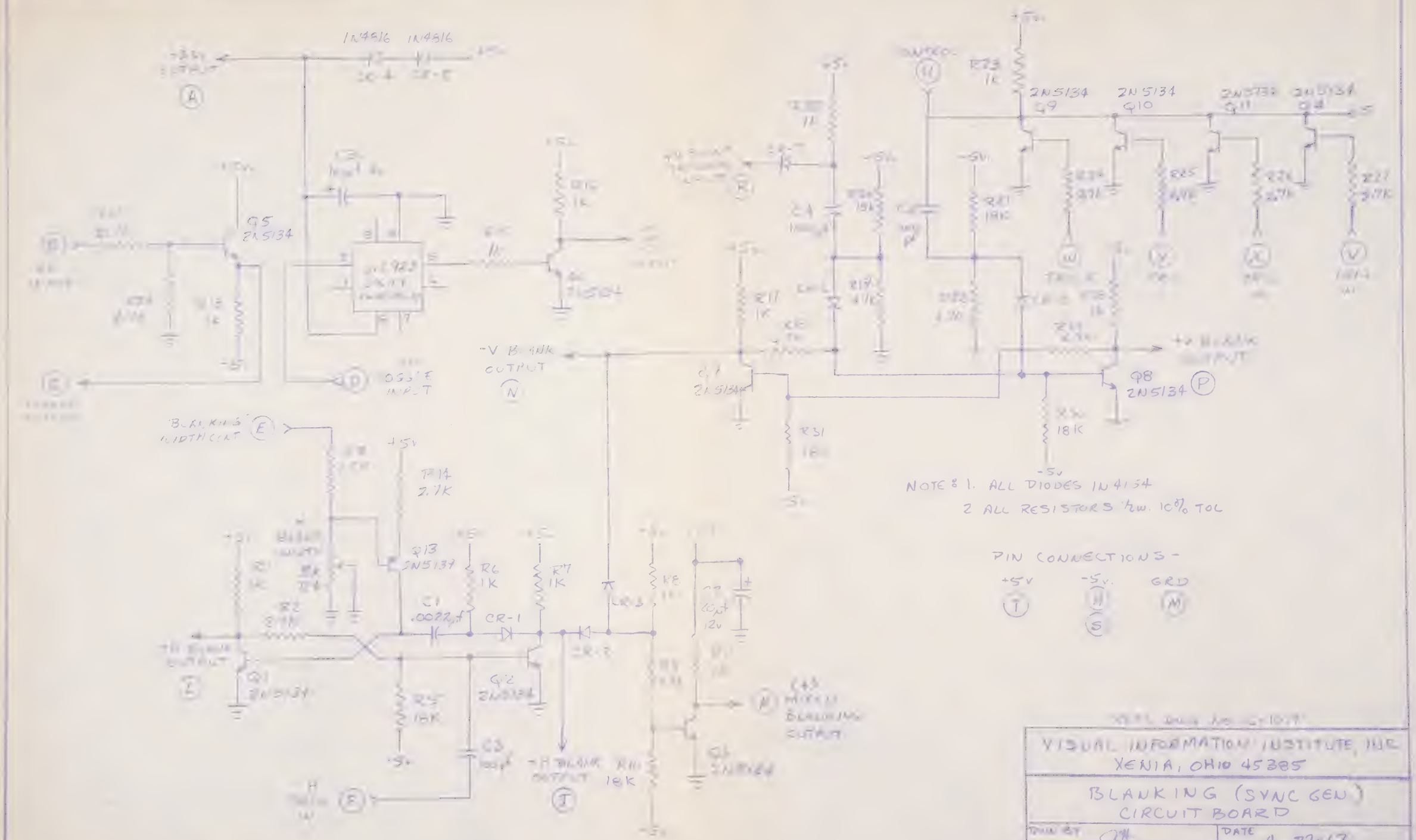


MARKING LIST

1	20 mf @ 12v.
1	100 pf
	C1 (Select)
	C2 (Select)

NOTE: REF DWG. L-1021B & SCHEMATIC S-0143 FOR C1 & C2 VALUES, PER APPLIC.

——— INSULATED WIRE, #24 STRANDED



VISUAL INFORMATION INSTITUTE, INC XENIA, OHIO 45385	
BLANKING (SYNC GEN.) CIRCUIT BOARD	
DRAWN BY QM	DATE 4-27-67
APPVD SM	DATE 4-27-67
REV 5-26-70	DWG NO S-0145

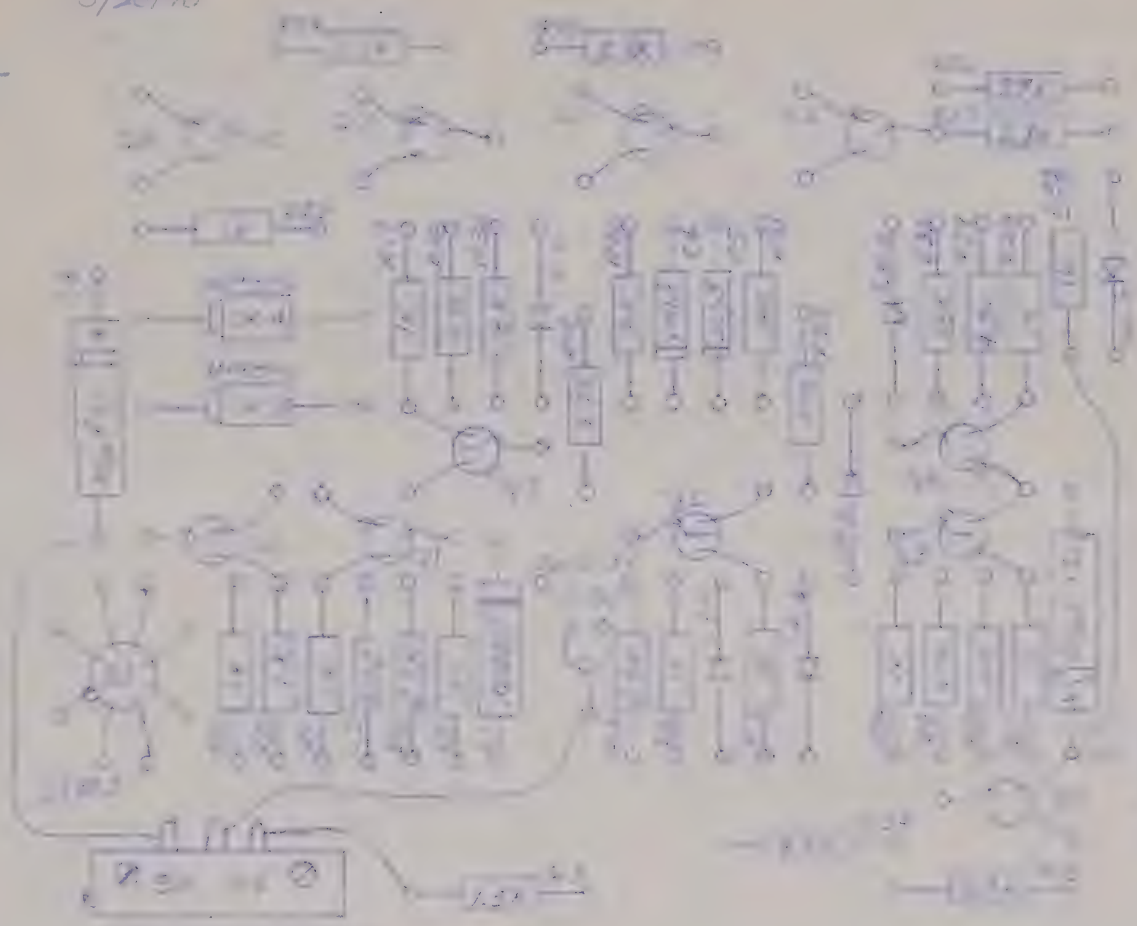
BLANKING BOARD

5/28/70

REV. SCHEMATIC S-0145

MATERIAL LIST

2	0.001 μf 2 KV.
1	100 pf
1	0.0022 μf 1 KV.
1	100 Ω 6 v.
1	200 Ω 12 v.
126	TERMINALS



NOTE: ALL TRANSISTORS 2N5134 EXCEPT AS NOTED.

—— INSULATED WIRE, #24 STRANDED

+3.6v. IN (J)

CH TOGGLE INPUT (T)

Z1 μL923 (1)

Z2 μL923 (2)

Z3 μL923 (4)

Z4 μL923 (8)

Z5 μL923 (16)

Z11 μL923 (512)

Z10 μL923 (256)

Z9 μL923 (128)

Z8 μL923 (64)

Z7 μL923 (32)

Z6 μL923 (16)

(S)

(Q) (W) (Y) (X) (Z)

WIDTH

(E) (B) (F) (C)

(T) (P) (V)

RESET OUT (R)

CKU (N)

R1 1K

R2 1K

R3 1K

R4 1K

R5 1K

R6 1K

R7 1K

R8 1K

R9 1K

R10 1K

R11 1K

Q1 2N1613A

Q2 2N1613A

Q3 2N1613A

Q4 2N1613A

Q5 2N1613A

Q6 2N1613A

Q7 2N1613A

Q8 2N1613A

Q9 2N1613A

Q10 2N1613A

Q11 2N1613A

(R) +5v.

R12 1K

C1 0.001μfd 1000v.

CR-1 HP5082-2800

4.7K R13

1K R11

(L)

(P) -5v.

NOTES

① ALL RESISTORS 1/2w. ±10%

② Z1 THRU Z11 FAIRCHILD UBA992328X

③ INTERCONNECT SHOWN FOR 525-LINE; REF. DWG. NO C-10162 FOR ALL RATES.

REVISIONS - SEE SHEET C-10162

VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO

COUNTER CIRCUIT BOARD
(TV/ILLUMINATOR)

DESIGNED	DATE 4-27-67
DRAWN	DATE 4-27-67
	DWG. NO. S-0144
6/14/71	

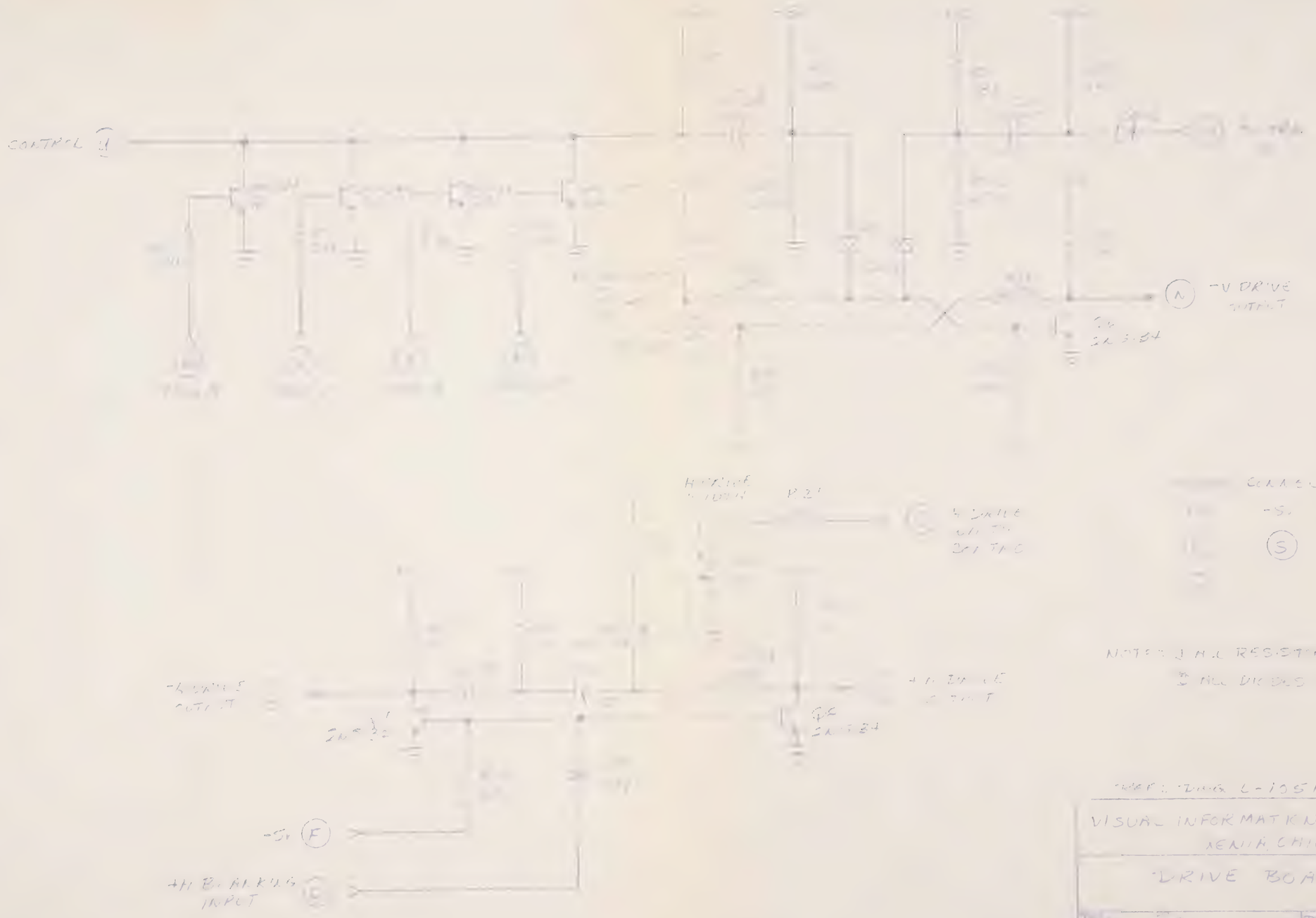
DWG. NO. L-1016

--- UNINSULATED WIRE, #22 SOLID
JUMPERS INSTALLED FOR SCAN RATE
DESIRED, PER DWG. NO. L-1016C

DWG. NO. L-1016C
PAGE 1 OF

- COUNTER CARD LISTING -

SYNC RATE	LINE COUNT	H BLANKING COUNT	V DRIVE COUNT	SCAN RATE	LINE COUNT	V BLANKING COUNT	V DRIVE COUNT
525	262 - T T - S S - R	16 - K K - H	8 - R R - P	1023	256 - J J - H H - G G - F F - E E - D D - C C - B B - A	32 - K K - J J - N	16 - P P - O
875	350 - T T - S S - R R - E E - A	4 - A A - 1 1 - M	8 - M M - L L - K K - J J - H				
729	292 - T T - S S - R R - E E - A	4 - A A - 1 1 - M	8 - M M - L L - K K - J J - H	1023	341 - T T - S S - R R - Q Q - P P - O O - N N - M M - L	32 - K K - J J - H H - G G - F F - E E - D D - C C - B	16 - P P - O O - N
945	378 - T T - S S - R R - E E - A	4 - A A - 1 1 - M	8 - M M - L L - K K - J J - H				
1023	409 - T T - S S - R R - E E - A	4 - A A - 1 1 - M	8 - M M - L L - K K - J J - H				
1225	490 - T T - S S - R R - E E - A	4 - A A - 1 1 - M	8 - M M - L L - K K - J J - H				
1029	411 - T T - S S - R R - E E - A	4 - A A - 1 1 - M	8 - M M - L L - K K - J J - H				


CONTROL
-V DRIVE OUTPUT
+H BLANKING INPUT
CONNECTIONS
-Sv
-HV
(S)
(M)
NOTES: 1 ALL RESISTORS ½W ±10%
2 ALL DIODES 1N4154
VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO
DRIVE BOARD
5-20-64

DWG. NO. L-1051
REF: SCHEMATIC S-0194

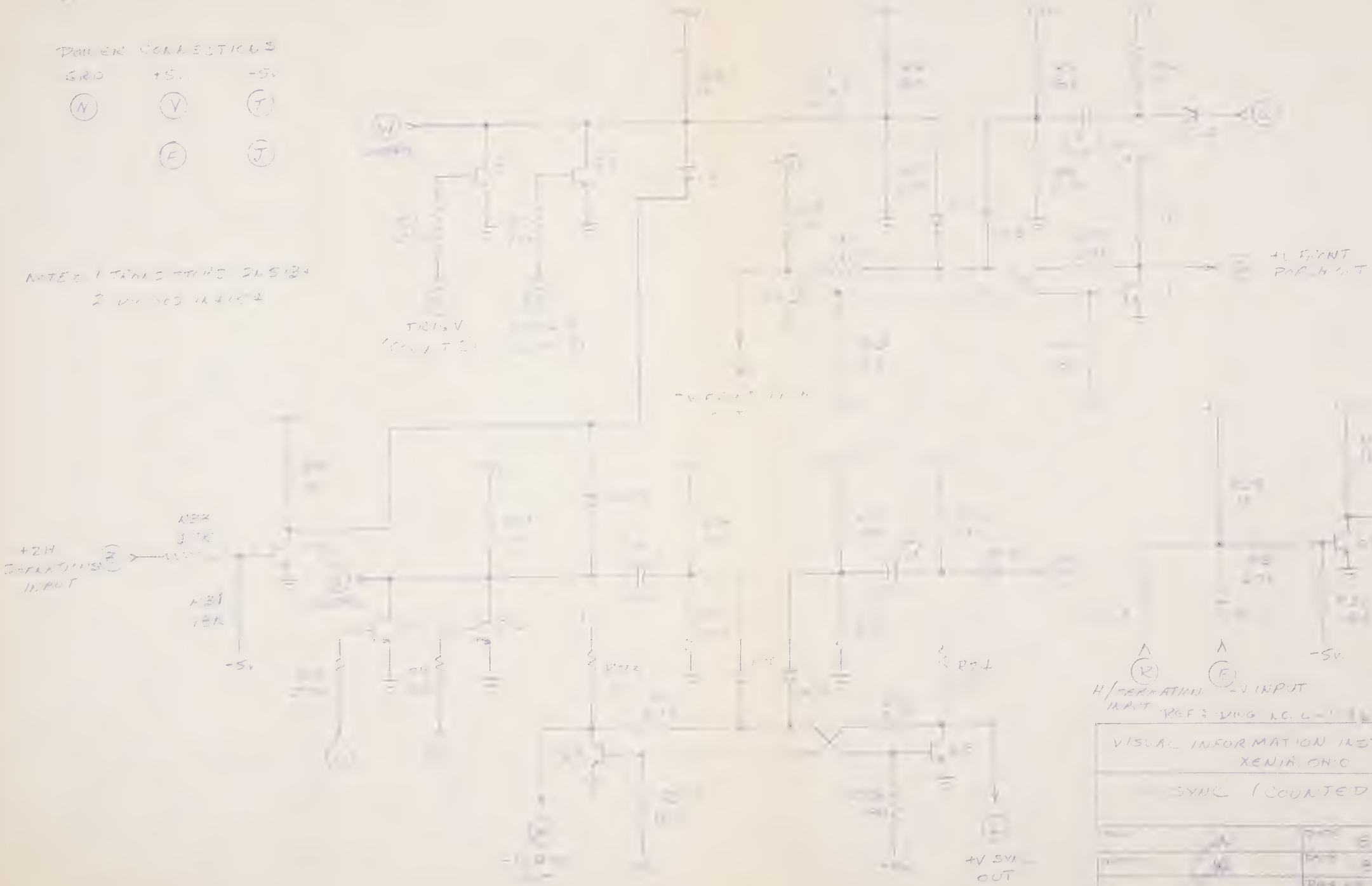
Z
Y
X
W
V
U
T
S
R
P
N
M
L
K
J
H
F -5V.
E +5V.
D +H BLK. IN
C WIDTH
B
A

NOTE: ALL TRANSISTORS 2N5134
EXCEPT AS NOTED.

POWER CONNECTIONS

GRD	+5.	-5.
(N)	(V)	(T)
	(E)	(J)

NOTE: TRANSISTORS 2N5134
2 UNUSED LEADS



VISUAL INFORMATION INSTITUTE INC.
XENIA, OHIO

SYNC (COUNTED) BOARD

	A	DATE 6/29/66
	M	DATE 8/29/66
		DWG NO. S-0155

REF: SCHEMATIC NO S-01

CONTROL

CONTROL

(1)

-L FR. IT (2)

-V INTERVAL IN

H.B. BLANKING IN

+5V

K31 10K

C33 1K

C4

C3

K33 1K

V TRIGGER OUT

(E)

(F)

POWER CONNECTIONS

+5V -5V

NOTES: 1 ALL TRANSISTORS 2N5134
EXCEPT Q3, 2N5131
2 ALL DIODES IN4154

REF. DWG NO. C-1CH7

SYNC INFORMATION INSTITUTE, INC.
NEW YORK

SYNC (PULSE) UNIT (NO.)
- VERTICAL & HORIZONTAL -

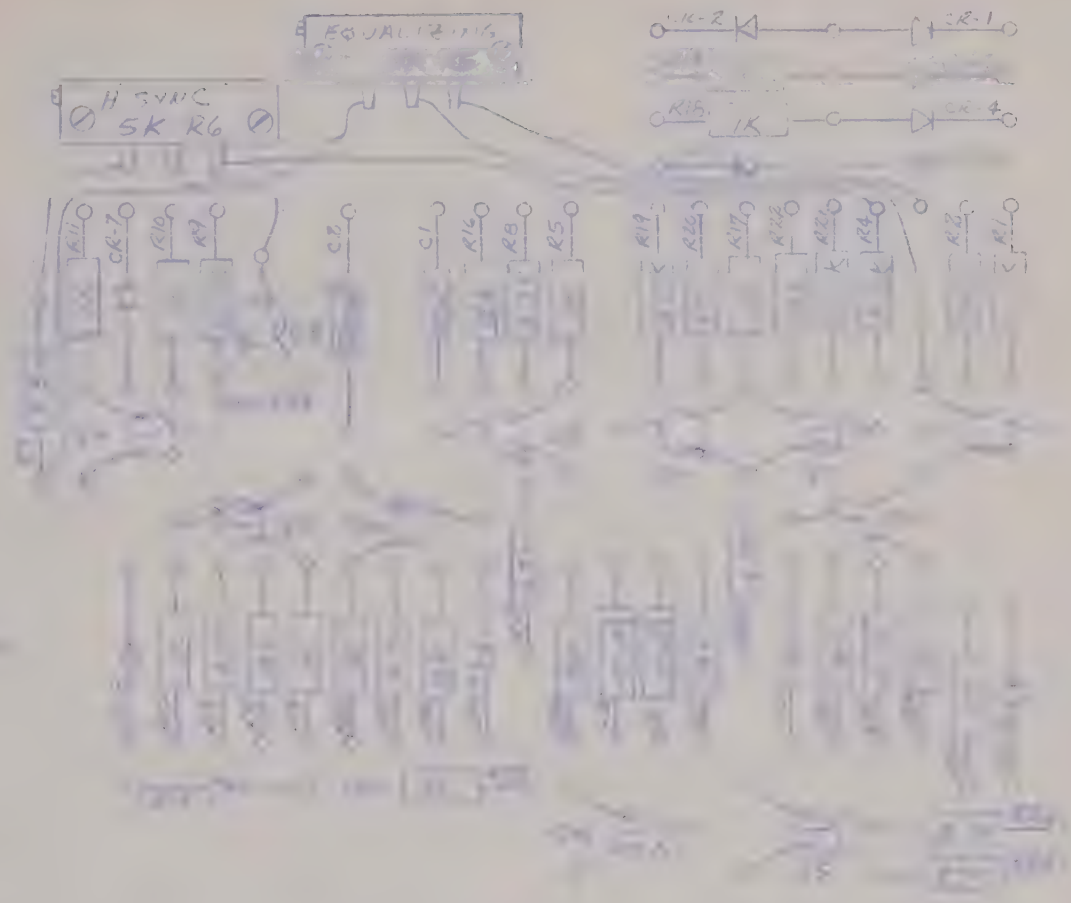
DRN.	DATE 5-20-68
CHK.	APPD. 5-20-68
	SHEET NO. 5-21/82

11/23/68

REF: SCHEMATIC S-0196

MATERIAL LIST

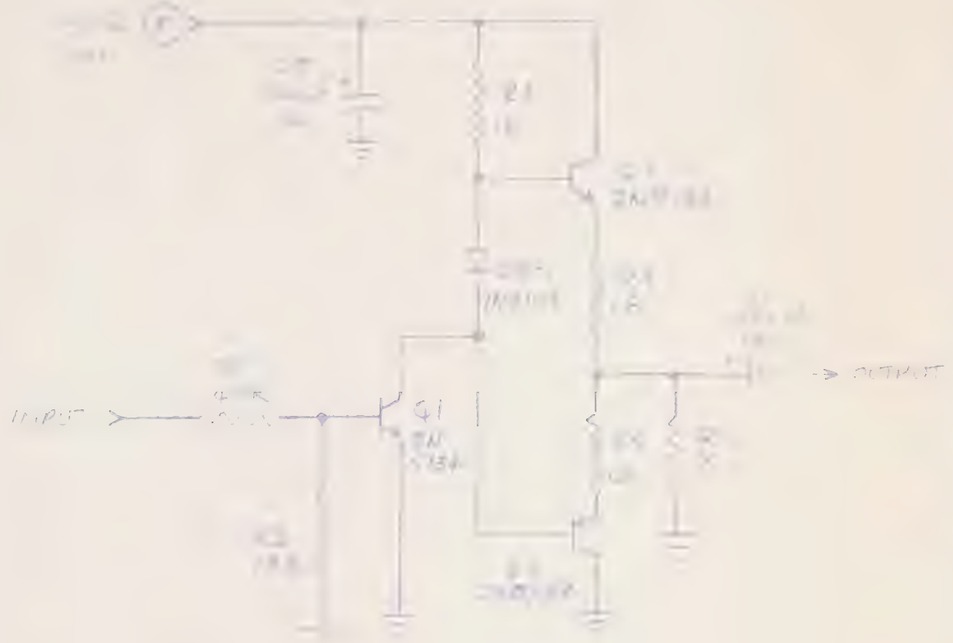
1	2N5134
10	2N5134
	TERMINALS



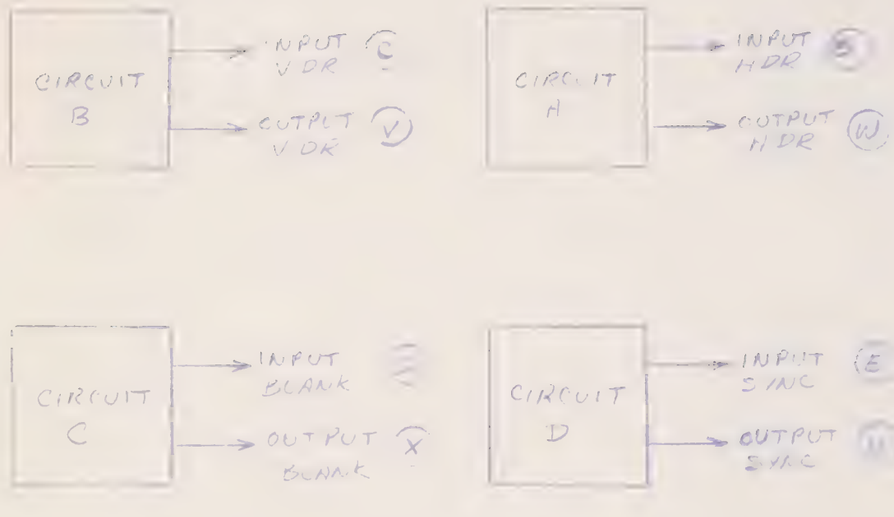
- Z -H F.P.
- Y +V INT.
- W H BLANK
- V -V INT. IN
- U ———
- T ———
- S -5v.
- R +5v.
- P CONTROL
- N ———
- M GRD
- L +SYNC OUT
- K +V INT OUT
- J -V INT OUT
- H V INPUT
- F -
- E +
- D — —
- C TRIG V (1)
- B TRIG X (8)
- A + GATED SCRN

*24 INSULATED WIRE, STRANDED

NOTE: ALL TRANSISTORS 2N5134 EXCEPT AS NOTED.



CIRCUIT DETAIL - USED FOUR PLACES



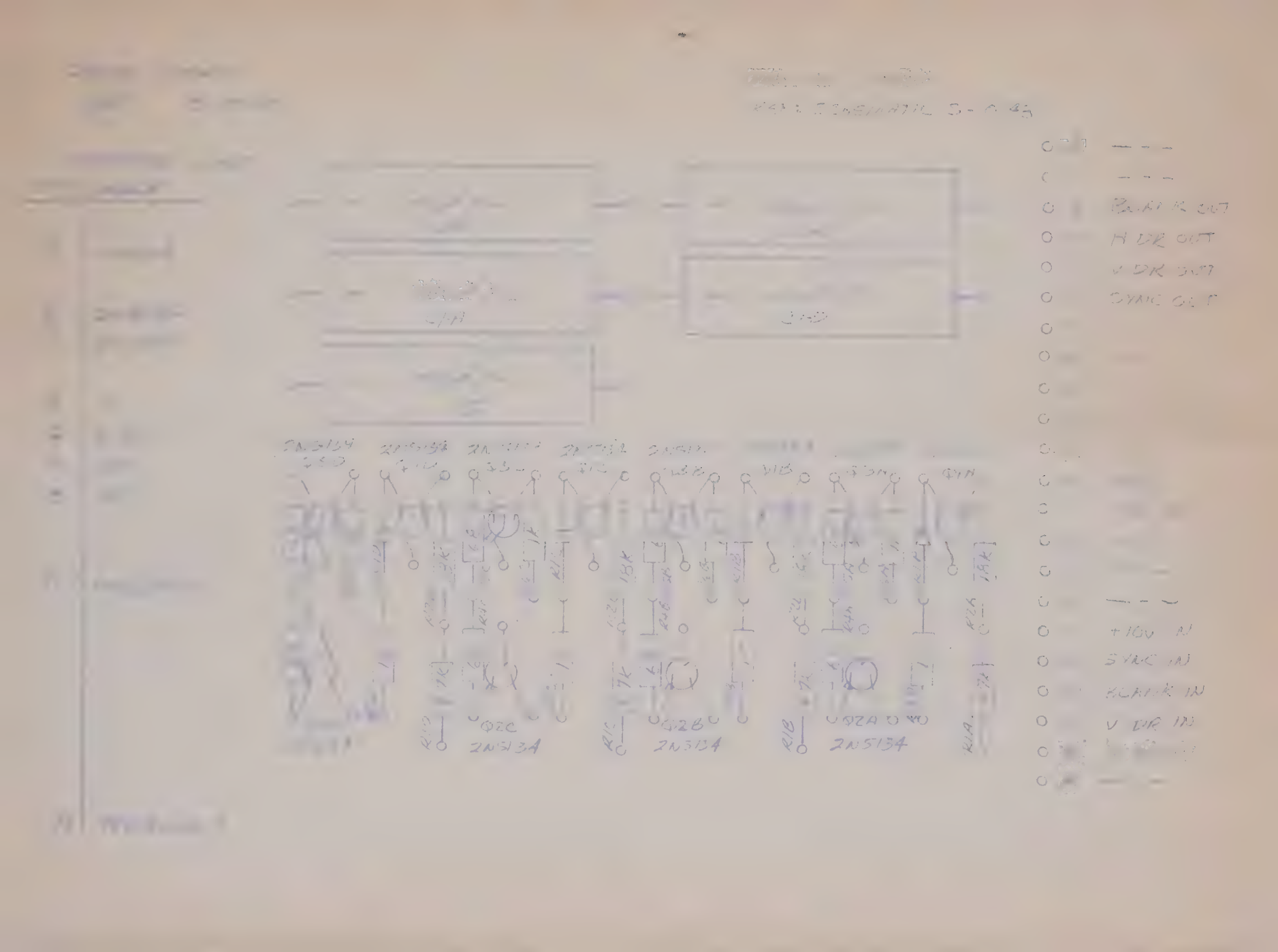
POWER CONNECTIONS -

+12V	-5V	GRD
(F)	(L)	(M)

NOTE: ALL RESISTORS ½W ±10% TOL

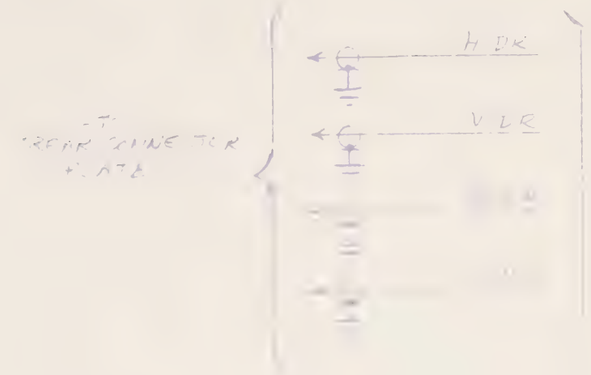
WCF: Dwg. L-102

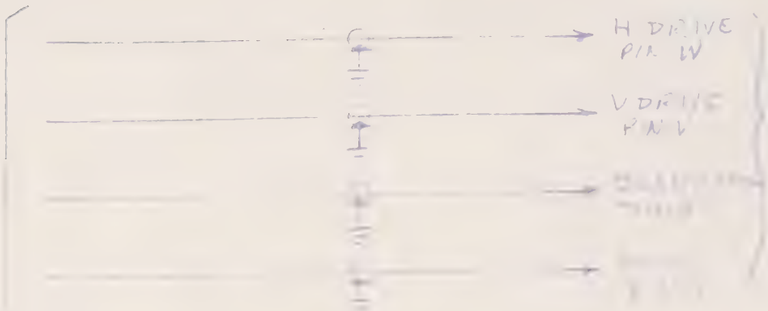
VISUAL INFORMATION INSTITUTE, INC. XENIA, OHIO	
PULSE OUTPUT CIRCUIT BOARD	
DRAWN	DATE 4-27-67
APPD	DATE 4-27-67
	DWG NO. S-0148
REV & ISS'D	

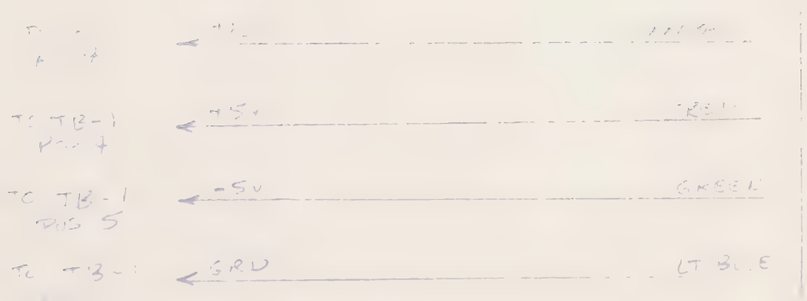

+10V IN
SYNC IN
BLANK IN
V DR IN
Q2C
2N5134
Q2B
2N5134
Q2A
2N5134

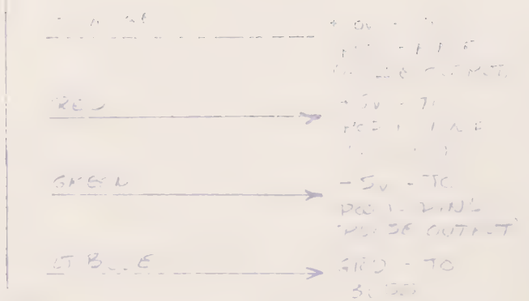
SYNC ACCESSORY FRAME
CONNECTIONS

REFER TO SCHEMATIC NO. S-CICE
FOR CONNECTIONS SHOWN HERE
(UNREGIS WIRING)









S-12-5

S-11(80)

REV 1-6-71

TYPICAL SYNC GENERATOR CHARACTERISTICS
2:1 INTERLACE

RATE	511	525	675	729	875	945	1023	1029	1225				
LINES PER FRAME	511	525	675	729	875	945	1023	1029	1225				
LINES PER FIELD	255.5	262.5	337.5	364.5	437.5	472.5	511.5	514.5	612.5				
FIELD RATE (H_z)	60 (SPECIAL)	60	60	60	60	60	60	60	60				
TOTAL H LINE (μsec)	65.2	63.4	49.4	45.7	36.0	35.3	32.6	32.4	27.2				
H REP RATE (kHz)	15.330	15.750	20.250	21.87	26.250	28,350	30.690	30.870	36.7150				
MASTER OSC. (kHz)	30.660	31.500	40.500	43.74	52.500	56.700	61.380	61.740	73.500				
COUNTER STEPS - (x2) (RESET)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5				
1	128	256	256	256	256	256	256	512	512				
2	64	4	64	64	128	128	128	2	64				
3	32	2	16	32	32	64	64		32				
4	16		1	8	16	16	32		4				
5	8			4	4	8	16						
6	4				1		8						
7	2						4						
8	1						2						
9							1						

TYPICAL PULSE WIDTHS (μsec)	V BLANKING	H BLANKING	V DRIVE	H DRIVE	H FR. POR.	H SYNC	V FR. POR.	V SYNC	V POST	H EQUAL	SERRATION		
511 SCAN RATE	20 LINES	11.0	10.5 LINES	6.4	1.5	4.75	3 LINES	3 LINES	3 LINES	2.35	4.5		
525	20 LINES	11.0	10.5 LINES	6.4	1.5	4.75	3 LINES	3 LINES	3 LINES	↓	↓		
675	26 LINES	7.0	13.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES	1.40	2.0		
729	28 LINES	7.0	14.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES				
875	33 LINES	7.0	17.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES				
945	36 LINES	7.0	18.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES				
1023	39 LINES	7.0	20.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES				
1029	39 LINES	7.0	20.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES				
1225	46 LINES	7.0	24.5 LINES	3.5	1.0	2.75	3 LINES	3 LINES	3 LINES				

(1250 μsec) (666 μsec)

NOTE: LEADING EDGE OF DRIVES COINCIDENT WITH BLANKING, H & V.

VISUAL INFORMATION INSTITUTE, INC.
XENIA, OHIO

SYNC GENERATOR CHARACTERISTICS
2:1 INTERLACE

DRN	JH	DATE 9/20/67
CKD	JH	DATE 9/20/67
REV	2-12-68	DWG NO. B-1212